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ABSTRACT

To determine whether increasing decoding speed affects the comprehension of poor readers, two experiments were designed to test two groups consisting of seven good readers and eleven poor readers chosen from fourth and fifth grade. In the first experiment, poor readers were trained to read a list of words as rapidly as the good readers and were then asked to read a passage comprised of the practiced words. From decoding speed measures and comprehension measures, the performance of the trained poor readers was compared to both their performance on an equivalent untrained passage and to the performance of good readers. The second experiment repeated the first, with the addition of a training condition which emphasized rapid phrase reading. The results of both experiments indicated that while decoding training significantly increased the decoding speed of single words, it did not improve comprehension performance. (Tables and figures are appended.) (Author/MAI)

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CENTER FOR THE STUDY OF READING

Technical Report No. 103

EFFECTS ON POOR READERS' COMPREHENSION OF TRAINING IN RAPID DECODING

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> fact lead to poorer comprehension . . . . The less work required by decoding, the more available the system is for other comprehension work (Note 1, p. 7).

Similarly, LaBerge and Samuels (1974) have formulated a model of information processing in which reading is portrayed as a series of processing stages. According to this model, printed stimuli are transformed successively into visual, phonological, and semantic codes. Substages exist within each major processing stage. For example, within the visual stage, letter features activate letter codes which activate spelling pattern codes which, in turn, activate word codes. The development of proficiency within and between stages is first marked by the attainment of accurate responding, and later by automatic responding. The distinction between accurate and automatic responding is that attention is required for the former but not the latter. Said differently, when automaticity has been achieved, a task can be done without using any of the limited capacity or attention of a central processor. To illustrate, after a history of exposure to letters, young children come to recognize and discriminate them accurately, "but it is costing them (children) a considerable amount of attention to do it (LaBerge and Samuels, 1974, p. 304). With repeated exposure to the letters, however, children gradually come to recognize them automatically, without allocating attention to the task. The notion of automaticity applies to higher level processes (comprehension) as well as to more basic processes (letter discrimination). As reading skill develops, words and their meanings are automatically processed, releasing attention for organizing meaning codes which are themselves stored and recalled on later occasions.

Reading educators have also been sensitive to the potential influences of decoding speed on comprehension. Some authorities have attempted to alert teachers to the potential importance of rapid or automatic decoding. Though these authorities tend not to present comprehensive models of reading, their view of the relationship between decoding speed and comprehension strongly resembles that contained in the previously described limited capacity models. In his text on the teaching of reading, Harris (1970) states, "some very slow readers do poorly in comprehension because their many repetitions and hesitations break up the continuity of thought" (p. 447). Similarly, Spache (1963) remarks that "When the reader can achieve a reading rate similar to the rate with which he can usually associate ideas in this area, his comprehension (thinking) is more natural and accurate" (p. 248).

There are at least two implications of a bottleneck or automaticity model which claims that being fast at decoding leads to high comprehension (Perfetti & Lesgold, in press), depending on whether one formulates a strong or weak hypothesis concerning the effects of successful decoding training. In the strong form, fast decoding is a sufficient condition for high comprehension. That is, comprehension is expected to benefit rather directly and automatically from instruction that increases decoding speed. In the weak form, the bottleneck model would predict that fast decoding is a necessary but not sufficient condition for good comprehension. While instruction that enhanced decoding speed would presumably release processing resources for comprehension, other conditions may need to exist before those resources actually affect comprehension. For example, the system may not immediately take advantage of the additional processing capability or may perhaps require time to refine and develop other comprehension

related processes or skills, such as, remembering surface information, forming semantic representations, relating new information to old, segmenting sentences, or remembering discourse topics. The bottleneck hypothesis is far easier to test in the strong form than in the weak form, since training effects should show immediate effects on comprehension.

The data base for the presumed influence of decoding on comprehension is essentially correlational, and as Perfetti (1976) has indicated, the basis for asserting the causal relationship between decoding rates and comprehension is still conceptual, not empirical. Little prior research has been conducted with poor readers on the effects of training in rapid decoding. Two studies (Dahl, Note 2; Samuels, Dahl, & Archwatemy, 1974) attempted to examine this issue experimentally. Their results indicated that groups of students who had received speeded isolated word training performed no better on comprehension tests than did untrained students. However, in neither of these studies did word drill produce effects on speed of word recognition; thus, failure to observe transfer effects on comprehension should come as no surprise.

The present experiments were designed to examine the strong form of the bottleneck hypothesis (viz., the decoding sufficiency hypothesis). The research strategy was to train poor readers to be fast decoders and then to examine the effects of this training on comprehension. If the bottleneck model is correct and if the training procedures are adequate, one would expect to observe a reduction in the comprehension discrepancy that distinguishes skilled from less skilled readers. The experiment provides a stronger test of the bottleneck model than it does of

automaticity theory, since it includes no demonstration that training resulted in a reduction of the attentional processes required for decoding. Rather, the criterion for decoding training is rapidity, specifically that observed in the decoding of skilled comprehenders.

EXPERIMENT I

Method

Subjects and Settings

Subjects came from the fourth and fifth grades and included seven good readers and eleven poor readers from each grade level. The good readers were identified by their classroom teachers as children with above grade level comprehension. To verify teacher judgement, scores on the reading subtest of the Metropolitan Achievement Test (MAT) (1970) were also obtained. All achievement test data was collected in the fall, and the experiment conducted during late spring and summer. Two students nominated as "good readers" were dropped from the analysis because their scores on the achievement test were below the 60th percentile. The mean reading level in grade equivalents for good readers was 7.46 (SD = 1.90) for the fourth graders and 7.74 (SD = 1.51) for the fifth graders.

The poor readers, also fourth and fifth graders, were receiving remedial instruction from Title I teachers. Two "poor readers" who scored above the 40th percentile on the MAT reading subtest were excluded in the analysis. The mean grade equivalent on the reading test was 2.62 (SD = .77) for the fourth graders and 2.98 (SD = .75) for the fifth graders.

Materials

Two passages which had been used in a study by Bormuth, Manning, Carr and Pearson (1970) were modified for purposes of this experiment. The resulting passages were roughly equivalent in length (104 and 109 words) and according to the Dale-Chall Readability Formula (1948) were at the 7.1 and 6.3 grade levels respectively. For each passage, two randomly ordered word lists were prepared such that all passage words were included on a list. List lengths for the two passages were 74 and 75 words. In addition, each word was also printed on a standard .076 x .127m index card, creating a pack of word cards for each passage. Six inferential questions and six factual questions were generated for each passage. Factual questions were those where the answer was directly stated in the text. Inferential questions required synthesizing the main idea (e.g., What is a good title?) or integrating the material in the text with the readers "knowledge of the world." In addition, a cloze test was constructed for each passage by deleting every fifth word.

Design

The effects of training were compared both within and between subjects. Poor readers were exposed first to the experimental condition (training in rapid decoding) and then the control condition (no training) and thus served as their own controls. Performance of poor readers was also compared to that of untrained good readers.

Procedure

Instruction and testing were both conducted in a one-to-one situation. In the rapid decoding treatment, poor readers received training on all the

words from one randomly selected passage. The students practiced these words in flash card drill until they could recognize each word within approximately one second. They were then tested on one of two randomly ordered word lists. Students were required to read this list accurately at a rate of 90 words per minute or less, with no more than one second per word. This criterion rate was determined by the performance of good readers during a pilot of the materials. If students failed to meet the criterion, they were given additional practice on that word list and on the flash card task. Practice was terminated when the student could read the alternate word list at the criterion rate. Students were allowed up to two suffix changes without having to repractice the words. These were recorded as errors, but the judgement was that criterion had been met. More than two suffix errors or the commission of any other error resulted in recycling through the practice task.

On the criterion check, the examiner recorded both total time to read the list and the number of errors. Students then received the corresponding passage and instructions to read it aloud. Instructions stressed reading for understanding and informed the students that questions about the story would follow. Students read the passage aloud while the experimenter recorded errors and total time. Meaning change errors and deletions were corrected by the experimenter so that comprehension would not be affected by reading inaccuracy. After completing the passage, students were asked 12 comprehension questions. The examiner wrote down all responses. Following the questions, the students read the cloze passage, responding orally to the blanks. The examiner transcribed

responses and corrected reading errors though no corrections were provided for errors involving the deleted words.

Procedures for the No Training control were identical for both poor and good readers. Students were given the word list for one of the passages and asked to read it aloud as fast, but as carefully as they could. Total time and errors were recorded. Next, they read the passage that corresponded to the word list and then completed the comprehension questions and the cloze measures. Directions in all cases were identical to those in the experimental condition, except that no training was given on the passage words. Passages were counterbalanced for order and training conditions.

Results

The dependent variables were words read per minute in isolation, and in context; number of errors in isolation, and in context; percent of exact cloze supplies, number of correct answers to factual questions, and number of correct answers to inferential questions. Means and standard deviations on each dependent measure for the three reader types are displayed in Table 1. A single overall analysis of variance was not possible since all

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Insert Table 1 about here.

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poor comprehenders read both passages, one with word training and one without, while each good comprehender read one of the two passages. Grade level was not included as a factor since a preliminary analysis revealed neither significant effects for grade level (except on reading rate) nor any interaction of grade level with reader type.

Comparison of Poor Untrained and Good Readers

A 2 (Reader Type) x 2 (Passage) analysis of variance was performed for each of the seven variables. Untrained poor readers and the good readers differed significantly on all seven measures: words read per minute in isolation, $F(1,32) = 115.36$, $p < .001$; errors in isolation $F(1,32) = 32.30$, $p < .001$; words read per minute in context, $F(1,32) = 126.16$, $p < .001$; errors in context, $F(1,32) = 21.95$, $p < .001$; percent correct cloze supplies, $F(1,32) = 40.73$, $p < .001$; factual questions, $F(1,32) = 4.22$, $p < .05$; and inferential questions, $F(1,32) = 16.84$, $p < .001$. There were no significant passage or interaction effects on any of the variables.

Comparison of Poor Trained and Good Readers

A 2 (Reader Type) x 2 (Passage) analysis of variance was performed for each of the seven dependent variables. The trained poor readers did not differ from the good readers on words read per minute in isolation, $F(1,32) = 2.63$, NS; or on number of errors in isolation, $F(1,32) = .33$, NS; or in context, $F(1,32) = 2.58$, NS. The good readers, however, read significantly more words per minute in context, $F(1,32) = 58.26$, $p < .001$; answered more inferential questions, $F(1,32) = 7.41$, $p < .01$; and successfully answered more cloze items, $F(1,32) = 47.80$, $p < .001$. Performance on factual questions narrowly missed conventional significance levels, $F(1,32) = 3.67$, $.05 > p < .06$.

Comparison of Poor Readers With and Without Training

A 2 (Training) x 2 (Passage) within subjects analysis of variance was performed for each of the seven dependent variables. Poor readers performed

significantly better with training than without training ($p < .001$) on all four measures of oral reading: words read per minute in isolation, $F(1,20) = 343.46$; errors in isolation, $F(1,20) = 57.49$; words read per minute in context, $F(1,20) = 57.62$; and errors in context, $F(1,20) = 42.17$. In contrast, training did not produce differences on any of the three comprehension measures, $F(1,20) < 2.47$. There were passage effects for factual questions, $F(1,20) = 5.40$, $p < .05$, but not for the other dependent variables.

Discussion

The reasoning underlying this research is that slow decoding detracts from comprehension because it uses an excessive share of processing resources. Moreover, instruction which increases decoding speed should result in improved comprehension. The present results replicate the commonly observed decoding speed differences for good and poor readers. Good readers were also more accurate decoders as judged by the number of errors made during context reading. However, since decoding errors were corrected during reading, it appears unlikely that accuracy differences accounted for the differences in comprehension. The training procedure apparently succeeded in bringing poor readers' speed of single word decoding to a level comparable to that of good readers, and to a level significantly higher than that observed in poor readers without training. This result was essential if transfer to comprehension was to be studied.

Results indicate that comprehension performance was not similarly facilitated by decoding training. Regardless of the comprehension measure, differences between good and poor readers were still large. Poor readers scored no better on comprehension measures when they received decoding

training than when they did not. This finding is particularly significant since training in single word decoding did transfer to context reading. Significantly higher reading rates in context were observed but these increased context rates were not accompanied by improved comprehension. It is also interesting that, despite their comparability on single word decoding, good readers were much faster in context than were the trained poor readers. This suggests that good readers take more advantage of syntactic and semantic information inherent in context than do their less skilled peers.

The present findings do not support a strong version of the bottleneck model: increased decoding speed was not sufficient for improved comprehension. It is possible, however, that certain aspects of the experimental methodology seriously attenuated the testing of the decoding-sufficiency hypothesis. First, the procedures for equating single word decoding speed for the good readers and trained poor readers may have overestimated the performance of the latter group. Decoding speed for the training condition was based on the students' final test of list reading. That is, students were repeatedly tested until they achieved a high test score. Such a procedure increases measurement error, enhancing the probability that an atypically high score was selected by chance. Thus, the trained poor readers may not have firmly achieved a single word decoding rate comparable to that of the good readers.

The fact that the context reading rate of the trained students was significantly slower than that of the good readers may be explained in part by the failure to produce comparable single word rates. However, the fact that poor readers read significantly faster in context with training than

without training would still pose a problem for the decoding sufficiency view. At least there would not appear to be a linear relationship between decoding speed and comprehension. One could imagine, however, that decoding speed (in context and/or for single words) must reach a minimum level before comprehension is affected, and that this threshold was not attained with the present training procedures.

A second potential problem with the experiment involved the perception of the reading task by the trained poor readers. Although the instructions given prior to the reading task emphasized comprehension and not speed, the students in the training condition may have perceived the task otherwise. Their recent history of training had involved speeded practice on word lists and stop watch timings of their performance. During their reading of the passage, it was also clear that they were being timed with a stopwatch. This combination of events may have induced them to read for speed rather than meaning, despite instructions to the contrary. Thus, rather than focusing attention on meaning, the experimental procedures may have inadvertently encouraged the trained students to focus on decoding. Because of these problems a second experiment was planned which would insure comparable single word decoding speed for good and poor readers, and which would attempt to lessen students' concern with speeded reading of the experimental paragraghs.

EXPERIMENT 2

This experiment was essentially a replication of the first with the addition of several methodological improvements. First, decoding training was continued until poor readers either matched or exceeded the levels

attained by good readers, and this measurement was based on a test given after training had ended. Second, students were not overtly timed during passage reading; rather, reading speed was determined from tape recordings of the session. Third, another training condition was added which emphasized phrase reading rather than single word decoding. It was hoped that this training procedure might have greater chances of affecting decoding speed in context. As individuals develop reading proficiency, they appear to code higher order units, e.g., word groupings or phrases (LaBerge & Samuels, 1974). Phrase Training employed in this study was intended to provide practice at the phrase level rather than at the single word level. Finally, a Story Retell measure was included in an effort to achieve a more sensitive measure of reading comprehension.

Method

Subjects

Nine fourth-grade and two fifth-grade good readers and twenty seven fourth-grade and six fifth-grade poor readers served as subjects. Good and poor readers were distinguished by their performance on the MAT and on a screening test specifically designed for the experiment. The screening test was a 127 word passage of approximately the same difficulty level as the experimental passages. All students were required to read a word list corresponding to the passage, read the passage itself, and then complete a cloze test on the passage. To qualify as a poor reader, students had to score at least one year below grade level on the achievement test, read below 60 words per minute on the word list, and score below 65 per cent on the cloze test. Of the 48 students originally identified as reading

at least one year below grade level, 36 also met the criteria on the screening task. One student was excluded due to repeated absences; two others were excluded due to extremely poor word recognition (less than 75% accuracy on the screening passage).

To be considered a good reader, students had to score at least one year above grade level on the achievement test, read a minimum of 75 words per minute on the list, and score at least 45 per cent on the cloze test. Of the 27 students originally identified as reading at least one year above grade level, 22 also met the screening task criteria. Eleven good readers were randomly excluded to equalize cell size.

Materials

The experimental passages used in Experiment I were modified to produce two passages of more comparable readability. The Dale-Chall grade equivalence of the resulting passages were 6.23 and 6.61. Six inferential questions, six factual questions, a cloze test, word cards, and ten randomly ordered word lists were prepared for each passage. In addition, five randomly ordered phrase lists were constructed for each passage. The phrases were constructed by dividing the passage into two to four word segments, taking care that none of the comprehension questions could be answered from any single phrase.

Design

A between subjects factorial design was used to evaluate the effects of training. Poor readers were randomly assigned to one of two training conditions (single word training or phrase training) or to a no training

control. Good readers were assigned to a no training control. Within each condition, experimental passages were randomly assigned to students.

Treatment Conditions

Poor readers-Single word training (Poor SW). Single word training was identical to that employed in Experiment 1. In this study, however, a more stringent criterion was used for terminating training. After flash card drill on isolated words, students practiced reading a word list until they could achieve the criterion rate of 95 words per minute. Next, students were presented with a second list and their reading timed. If, on this new list, students failed to achieve the criterion rate, they continued to practice that list until they succeeded. Students were presented with successive lists in this fashion until they read two consecutive lists at the criterion rate, without specific practice on the lists.

Poor readers-Phrase training (Poor-Ph). In this condition students were given a randomly ordered list of phrases from the passage. They practiced this list until they could read it at a rate of 160 words per minute with no errors. This criterion level was based on performance of a sample of good readers. Next, a second list was presented and the students timed. If students failed to achieve the criterion rate on this new list, they continued to practice that list until they succeeded. Practice continued in this manner until students read two consecutive phrase lists at the criterion rate, without practice on those particular lists.

Good and poor reader-Controls. Two control groups were formed, one with poor readers (Poor-C) and one with good readers (Good-C). Neither of these groups received training on words that appeared in the experimental passages.

Dependent Measures

Posttesting procedures were identical for all conditions. Students were given a word list and asked to read it as fast and accurately as they could. Total time and errors were recorded. Students were next given the appropriate passage and were instructed to read it aloud. The instructions stressed reading for understanding and made no mention of speed. Students were told that they would be questioned on the contents of the passage afterwards, and asked to retell the story. The experimenter corrected any meaning-change errors or deletions that occurred during reading, and tape recorded the students reading performance. These recordings were later used to measure reading rate. Upon completing the passage, the students were asked to tell everything they could remember about the story. The only prompt was "anything else?", given until each student responded "nothing else." Next the experimenter asked twelve comprehension questions and recorded all responses. Finally, students completed a cloze version of the passage following the same procedure as that employed during the screening task.

Of the six measures, two focused on speed of word decoding (words read per minute in isolation and words read per minute in context) and four

measures focused on comprehension (number of correct factual questions, number of correct inferential questions, per cent of exact close substitutions, and per cent of idea units included in the story retell). To score the story retell, each passage was divided into idea units using a procedure outlined by Schwartz, 1978. Two independent raters divided the passages and disagreements were reconciled by a third rater. The two passages yielded idea unit counts of 44 and 37, respectively. Each student's retell was compared to the list of idea units generated from the passage. Credit was given for recall of an idea unit if all components of the particular idea were included, even if they were not recalled verbatim. Two individuals scored each recall protocol. Interrater reliability was calculated by dividing the number of idea units agreed upon by both graders, by the number of agreements and disagreements. Mean reliability was 91.8%.

Procedure

Instructions and testing were again conducted in one-to-one sessions, with each session lasting approximately 30 minutes. In the first session students read a short paragraph, completed a cloze exercise, and practiced retelling the paragraph. Modeling and feedback was provided by the experimenter. This was designed to familiarize students with the comprehension measures. The screening test described earlier followed this familiarization exercise. Poor readers in the training conditions then received instruction in their respective tasks until they achieved the criterion decoding rates. In the subsequent session, the posttests were given.

Students in the control conditions received a posttest approximately one week after screening.

Results

Records were kept of the number of training sessions required for students to achieve criterion in their treatment conditions. Mean numbers of training sessions for the Poor-SW condition and the Poor-Ph were 3.55 (SD = 1.44) and 3.57 (SD = 2.17), respectively.

Means and standard deviations on the performance of all conditions are displayed in Table 2. Preliminary analyses indicated that passage was not a significant factor for any dependent variable. Subsequent analyses were collapsed across passages.

Insert Table 2 about here.

A one-way analysis of variance was computed for each of the six dependent variables. ANOVAs indicated significant differences ($p < .001$) on all dependent variables: decoding speed for single words, $F(3,40) = 22.44$; decoding speed in context, $F(3,40) = 8.43$; factual questions, $F(3,40) = 4.56$; inferential questions, $F(3,40) = 11.48$; cloze, $F(3,40) = 12.90$; and retell, $F(3,39) = 9.91$.

Newman-Keuls tests were performed to locate differences between groups. On single word decoding speed, all groups differed significantly, ($p < .05$), from one another, except the Good-C and Poor-SW. Good-C, Poor-SW, and Poor-Ph groups performed significantly better than the Poor-C; and, the

Good-C and Poor-SW groups performed significantly better than the Poor-Ph. On speed in context, factual questions, inferential questions, and story retell, Good-C differed from all other conditions. There were no differences between any poor reader group regardless of the training condition. On the cloze measure, all groups differed significantly from one another except for the Poor-SW v. Poor-C comparison. Good readers performed significantly better than the three poor reader groups, and the Poor-Ph group performed significantly better than the Poor-SW or Poor-C groups.

Discussion

In general, the results of the second experiment replicated those of the first experiment. Decoding training, whether focussing on isolated words or on phrases, significantly increased the decoding speed of single words. Phrase training was somewhat less effective than single word training since it did not bring poor readers to a single word decoding rate equivalent to that observed in good readers. As in the first experiment, decoding training failed to pay dividends in improved comprehension. Poor readers with either single word or phrase training performed no better on comprehension measures than did poor readers without training. Furthermore, their comprehension scores were far lower than those of their good reader counterparts. That phrase training significantly affected cloze performance can be explained by these students' prior training on the exact phrases which appeared in the passage. This interpretation is supported by the finding that the phrase training group scored no better than poor reader

controls on any other comprehension measure. In fact, the facilitation on cloze may be viewed as a secondary validation of the effectiveness of the phrase training procedure. Taken together, the overall results on single word decoding speed and on comprehension are not those that would be predicted by a decoding-sufficiency hypothesis.

Unlike results of Experiment 1, decoding training in Experiment 2 did not significantly improve decoding speed in context. Figure 1 displays

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Insert Figure 1 about here.

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the effects observed in the two experiments for single word and context decoding speed. In both experiments the number of words read per minute in context by trained poor readers was higher than that of untrained poor readers, but in the second experiment the difference is much smaller. This may be due primarily to the higher context performance of untrained poor readers in the second experiment. Across the two experiments, these untrained groups had highly similar single word decoding rates, but differed in context rates by more than 27 words per minutes. Though the differences between poor reader groups in context decoding did not reach significance, there is a definite trend which favors the trained groups. Such a trend is notably absent on any of the comprehension measures. In neither experiment did training influence comprehension.

A second finding that distinguishes the experiments involves the degree to which various groups' decoding speeds were affected by context. In the second experiment untrained poor readers appeared to benefit from context

to the same degree as did good readers, (cf. the similarity of the single word-context slope for these two reader groups). This was clearly not the case in Experiment 1 where decoding speed of untrained poor readers was only slightly higher with context than with single words (cf. the single word-context slope of good readers with that of untrained poor readers). Whether or not poor readers benefit from context as much as good readers is a question worthy of further research.

Findings from both experiments are in agreement with reference to the transfer of single word training to reading in context. Trained poor readers who achieved single word decoding rates comparable to that of good readers did not gain the additional context benefits that are observed with good readers. In fact, their context decoding rates are quite similar to their single word decoding rates after training.[1] This suggests that the trained poor readers may be reading text in a word by word fashion, much as they do with single word presentations.

A decoding-sufficiency hypothesis, or information processing bottleneck model, states that slow decoding detracts from comprehension, and predicts that instruction which increases decoding speed will pay dividends in comprehension. The results of the present experiments challenge the decoding sufficiency view. Training succeeded in producing poor readers whose decoding speed on a circumscribed set of words was comparable to that of good readers. Nevertheless, comprehension scores remained unaffected. Poor readers appeared to have difficulty in transferring single word skills to context, and thus to comprehension of connected discourse. By themselves,

these data suggest that if decoding speed is implicated in comprehension, the relationship may be one of necessity rather than sufficiency.

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Footnotes

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[1]The single word-context slopes for the trained poor readers are somewhat different in the two experiments. We suspect that the slightly negative slope observed in the first experiment is due to an overestimation of the single word decoding speed for this group, due to the measurement procedure employed (see text). With the less biased measurement procedure employed in Experiment 2, this slope becomes moderately positive, although substantially less positive than the slopes observed with the other groups in the experiment.

Table 1

Means and Standard Deviations on Each Dependent Measure

For Three Reader Types

Dependent Measures	Reader Types		
	Poor Control	Poor-Single Word Training	Good Control
Single Words/Minute	43.36 (14.84)	92.91 (9.58)	99.50 (14.99)
Errors on Single Words	13.72 (8.13)	.72 (.93)	.93 (1.07)
Words/Minute in Context	61.45 (21.90)	91.32 (25.80)	168.43 (35.72)
Errors in Context	10.36 (6.83)	3.04 (3.46)	1.42 (1.50)
Cloze-Percent Exact	34.45 (10.86)	30.09 (12.25)	59.00 (11.48)
Questions:			
Factual	3.32 (1.58)	3.18 (1.87)	4.28 (1.49)
Inferential	2.86 (1.39)	3.23 (1.85)	4.86 (1.46)

Note: Standard deviations in parentheses.

Table 2

Means and Standard Deviations on Each Dependent Measure

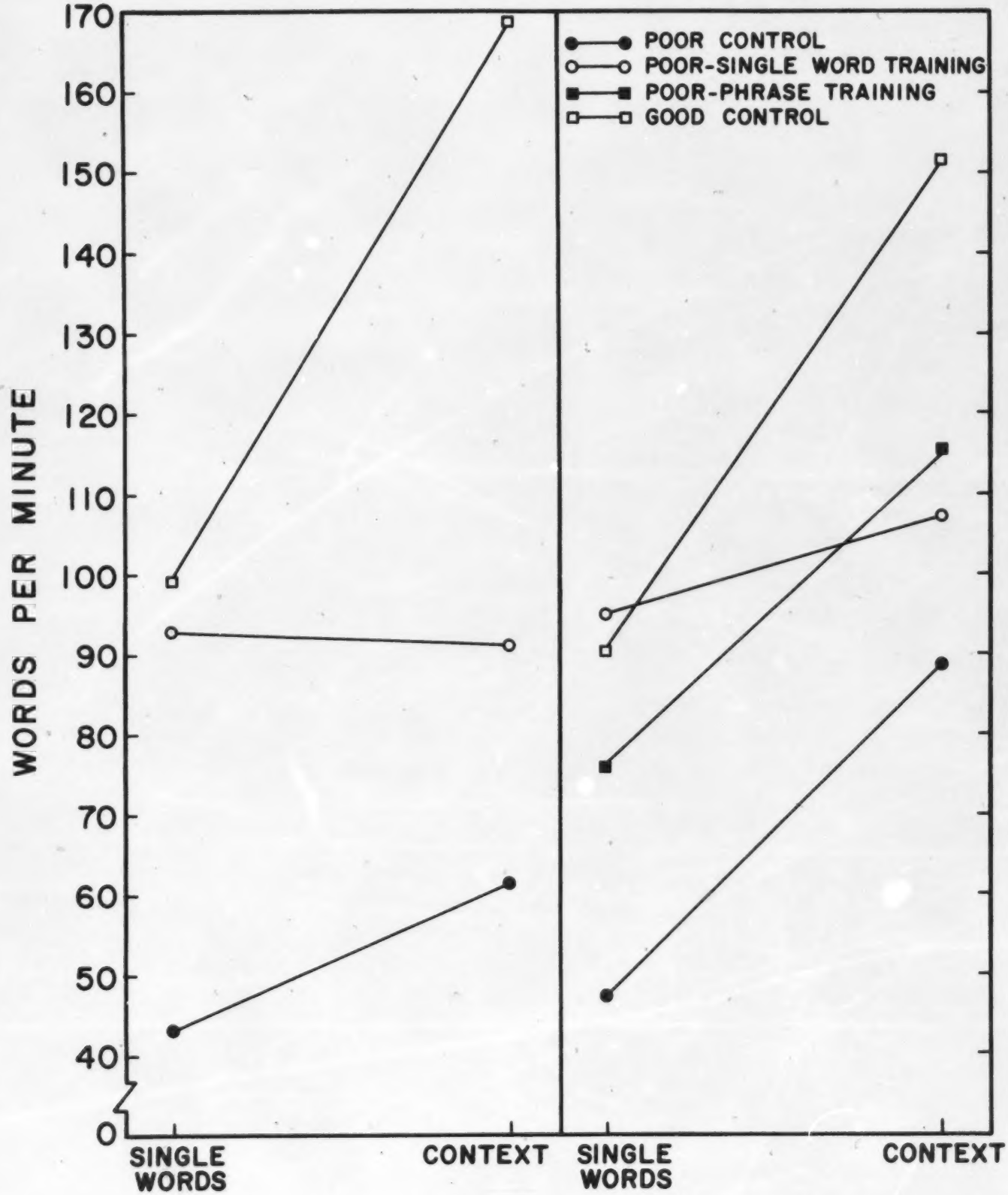
For Four Reader Types

Dependent Measures	Reader Types			
	Poor Control	Poor-Single Word Training	Poor-Phrase Training	Good Control
Single Words/ Minute	47.45 (14.65)	95.27 (12.83)	76.00 (17.24)	90.09 (14.98)
Words/ Minute in Context	88.64 (33.94)	107.36 (33.80)	115.64 (33.11)	151.63 (15.83)
Cloze-Percent	38.73 (14.04)	35.18 (16.01)	56.09 (19.57)	70.36 (8.43)
Questions:				
Factual	1.82 (1.47)	2.54 (1.63)	1.73 (1.95)	4.00 (1.41)
Inferential	2.27 (1.10)	1.82 (1.54)	2.00 (1.90)	4.91 (.94)
Retell: Idea Units	13.80 (7.49)	13.45 (12.77)	12.00 (8.46)	31.73 (9.55)

Note: Standard deviations in parentheses.

Figure Caption

Figure 1. Mean words read/minute in isolation and context for the two experiments by the good readers control (G-C), poor readers with single word training (P-SW), poor readers with phrase training (P-Ph), and poor readers control (P-C) groups.


POOR CONTROL
POOR-SINGLE WORD TRAINING
POOR-PHRASE TRAINING
GOOD CONTROL
WORDS PER MINUTE
170
160
150
140
130
120
110
100
90
80
70
60
50
40
0
SINGLE WORDS
CONTEXT
SINGLE WORDS
CONTEXT
EXPERIMENT 1
EXPERIMENT 2

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